IPW

Docket No.: 240356US0

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ATTORNEYS AT LAW

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

RE: Application Serial No.: 10/618,640
Applicants: Hideki SUGIURA, et al.
Filing Date: July 15, 2003
For: EXTERNAL ADDITIVE FOR TONER FOR ELECTROPHOTOGRAPHY, TONER FOR ELECTROPHOTOGRAPHY, DOUBLE-COMPONENT DEVELOPER FOR ELECTROPHOTOGRAPHY, IMAGE-FORMING PROCESS USING THE TONER, AND IMAGE-FORMING APPARATUS USING THE TONER
Group Art Unit: 1756
Examiner: DOTE, J.L.

SIR:

Attached hereto for filing are the following papers:

Response with Cited Pending Applications (2) as filed November 28, 2003 and September 23, 2004

Our check in the amount of **$0.00** is attached covering any required fees. In the event any variance exists between the amount enclosed and the Patent Office charges for filing the above-noted documents, including any fees required under 37 C.F.R 1.136 for any necessary Extension of Time to make the filing of the attached documents timely, please charge or credit the difference to our Deposit Account No. 15-0030. Further, if these papers are not considered timely filed, then a petition is hereby made under 37 C.F.R. 1.136 for the necessary extension of time. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

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DOCKET NO: 240356US0

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :

HIDEKI SUGIURA, ET AL. : EXAMINER: DOTE, J. L.

SERIAL NO: 10/618,640 :

FILED: JULY 15, 2003 : GROUP ART UNIT: 1756

FOR: EXTERNAL ADDITIVE FOR TONER FOR ELECTORPHOTOGRAPHY, TONER FOR ELECTROPHOTOGRAPHY, DOUBLE-COMPONENT DEVELOPER FOR ELECTROPHOTOGRAPHY, IMAGE-FORMING PROCESS USING THE TONER, AND IMAGE-FORMING APPARATUS USING THE TONER :

RESPONSE

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

In response to the Examiner's requirement at pages 6-7, paragraph 4 of the Official Action dated October 26, 2005, **submitted herewith** are copies of the cited pending applications as listed in the IDS/List of Related Cases filed on November 28, 2003 and September 24, 2004.

Respectfully submitted,

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WHAT IS CLAIMED IS:

1. A toner for developing an electrostatic image, comprising:

a colorant; and

a binder resin,

wherein the toner has a particle comprising at least one pore having a diameter of 10 nm or over, and a porosity thereof is in a range from 0.01 to 0.60.

2. A toner for developing an electrostatic image according to claim 1, wherein the diameter of the at least one pore included in the particle of the toner is 50 nm or over.

3. A toner for developing an electrostatic image according to claim 1, wherein the diameter of the at least one pore included in the particle of the toner is 200 nm or over.

4. A toner for developing an electrostatic image according to claim 1, wherein the particle of the toner comprises ten or more pores, the diameter of each of the pores being 10 nm or over.

5. A toner for developing an electrostatic image according to claim 1,

wherein the porosity is in a range from 0.01 to 0.50.

6. A toner for developing an electrostatic image according to claim 1, wherein the toner is constituted of a particle which is formed by a manufacturing process comprising:

dispersing in a water medium an oil droplet of an organic solvent in which the toner's composition comprising a prepolymer is contained, and

at least one of elongating and cross-linking of the prepolymer.

7. A toner for developing an electrostatic image according to claim 6, wherein the manufacturing process further comprises a degassing reaction.

8. A toner for developing an electrostatic image according to claim 6, wherein

the prepolymer comprises an isocyanate-group, and

an amine is used as at least one of an elongation agent and a cross-linking agent when the prepolymer is subjected to the at least one of the elongation process and the cross-linking process.

9. A toner for developing an electrostatic image according to claim 1, wherein the toner comprises at least a polyester resin.

10. A toner for developing an electrostatic image according to claim 9, wherein the toner comprises at least a modified polyester resin.

11. A toner for developing an electrostatic image according to claim 10, wherein the toner further comprises an unmodified polyester resin.

12. A toner for developing an electrostatic image according to claim 1, wherein the particle of the toner has an average sphericity E of 0.90 to 0.99.

13. A toner for developing an electrostatic image according to claim 1, wherein the particle of the toner has a sphericity SF-1 of 100 to 150 and a sphericity SF-2 of 100 to 140.

14. A toner for developing an electrostatic image according to claim 1, wherein the particle of the toner has a volume average particle diameter Dv of 2 μm to 7 μm and Dv/Dn of 1.25 or below which is a ratio of the volume average particle diameter Dv to a number average particle diameter Dn.

15. A toner for developing an electrostatic image according to claim 14, wherein the volume average particle diameter Dv of the particle of the toner is 4 μm to 7 μm.

16. A two-component developer, comprising:

a carrier made of a magnetic particle; and

a toner for developing an electrostatic image, the toner comprising:

a colorant, and

a binder resin,

wherein the toner has a particle comprising at least one pore having a diameter of 10 nm or over, and a porosity thereof is in a range from 0.01 to 0.60.

17. An image forming apparatus, comprising:

an electrostatic image carrier;

a charging unit for charging the electrostatic image carrier;

an exposing unit for making an exposure, in a form of an image, to the electrostatic image carrier charged by the charging unit to thereby form an electrostatic image;

a developing unit packed with a developer, and developing with the developer the electrostatic image on the electrostatic image carrier to thereby form a toner image; and

a transfer unit abutting on a surface of the electrostatic image carrier via a transfer material, and transferring the toner image to the transfer material,

wherein the developer is a two-component developer comprising:

a carrier made of a magnetic particle, and

a toner for developing the electrostatic image, the toner comprising:

a colorant, and

a binder resin,

wherein the toner has a particle comprising at least one pore having a diameter of 10 nm or over, and a porosity thereof is in a range from 0.01 to 0.60.

18. A process for forming an image, comprising:

charging an electrostatic image carrier;

exposing, in a form of an image, to the electrostatic image carrier charged by the charging to thereby form an electrostatic image;

developing with a developer the electrostatic image on the electrostatic image carrier to thereby form a toner image; and

transferring the toner image to a transfer material by allowing a transfer unit to abut on a surface of the electrostatic image carrier via the transfer material and,

wherein the developer comprises:

a colorant, and

a binder resin,

wherein a toner has a particle comprising at least one pore having a diameter of 10 nm or over, and a porosity thereof is in a range from 0.01 to

0.60.

19. A process cartridge, comprising:

an electrostatic image carrier; and

at least one of the following:

a developing unit packed with a developer, and developing with the developer an electrostatic image on the electrostatic image carrier to thereby form a toner image,

a charging unit for charging the electrostatic image carrier, and

a cleaning unit for removing a toner remaining after a transfer on a surface of the electrostatic image carrier,

so as to form an integrated structure,

wherein the process cartridge is adapted to be attached to and detached from a main body of an image forming apparatus,

wherein the developer comprises:

a colorant, and

a binder resin,

wherein the toner has a particle comprising at least one pore having a diameter of 10 nm or over, and a porosity thereof is in a range from 0.01 to 0.60.

20. A process for measuring a porosity of a toner, comprising:

irradiating a focused ion beam to the toner which is conductivity-treated and is held on a support body;

forming the toner's cross section having a thickness of 100 nm to 300 nm; and

calculating a pore area of the toner's cross section.

ABSTRACT OF THE DISCLOSURE

A toner for developing an electrostatic image, includes: a colorant; and a binder resin. The toner has a particle including at least one pore having a diameter of 10 nm or over, and a porosity thereof is in a range from 0.01 to 0.60.

FIG. 1

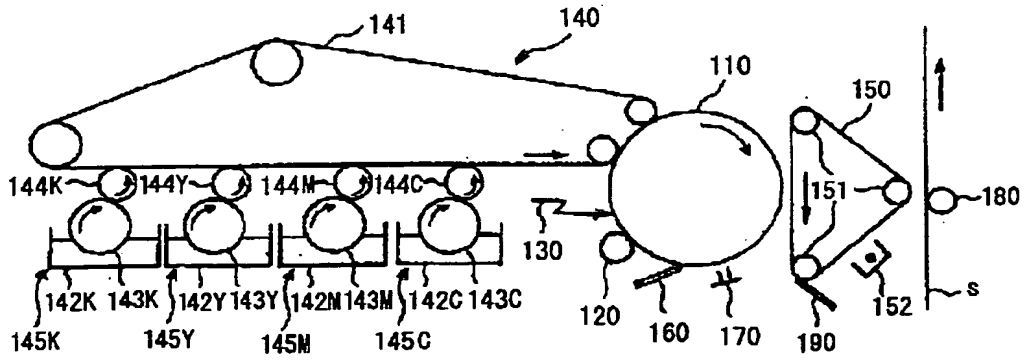

FIG. 2

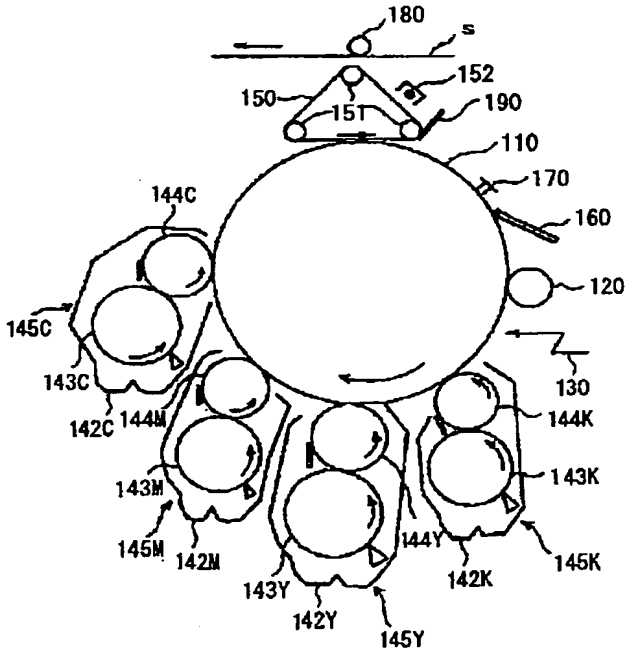

FIG. 3

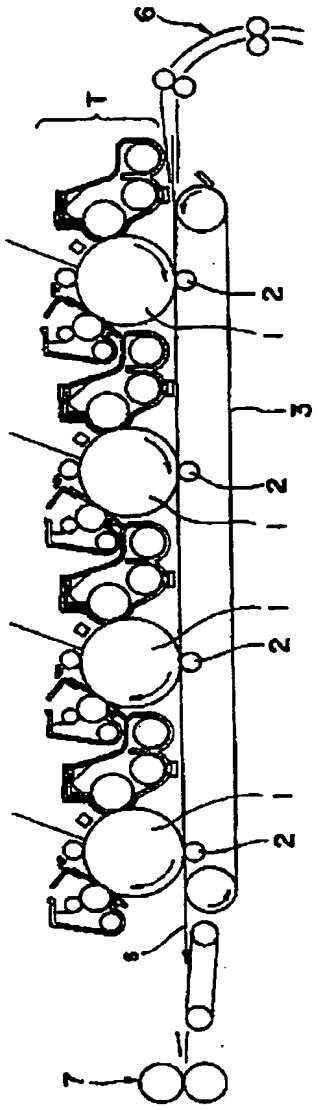

FIG. 4

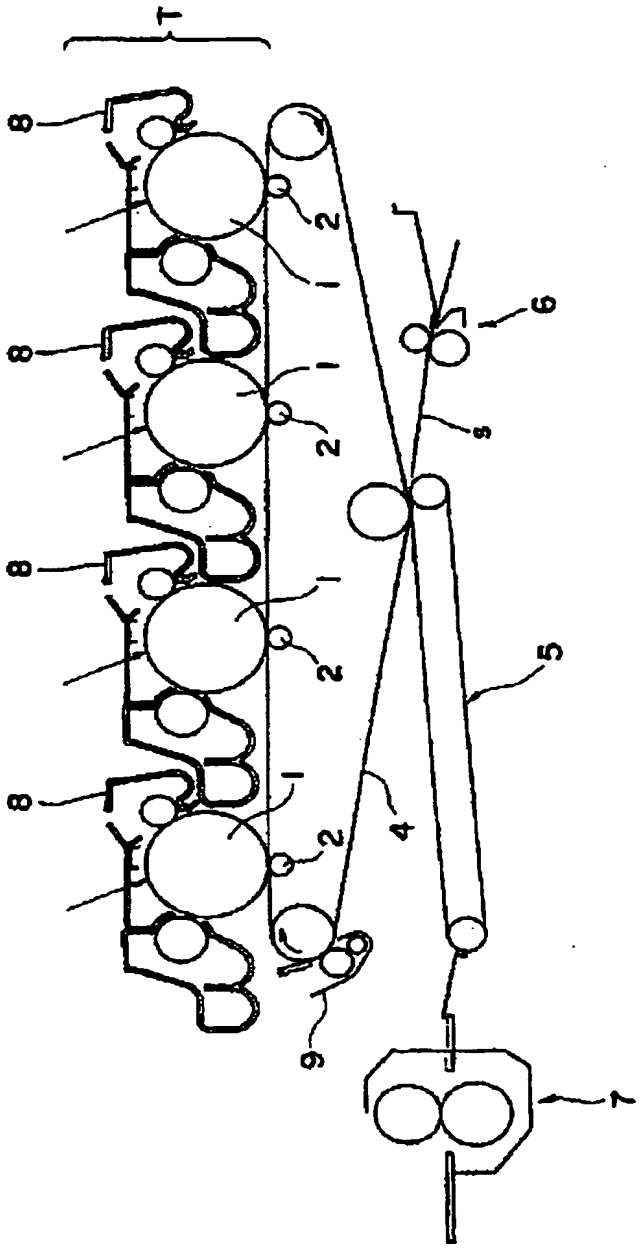

FIG. 5

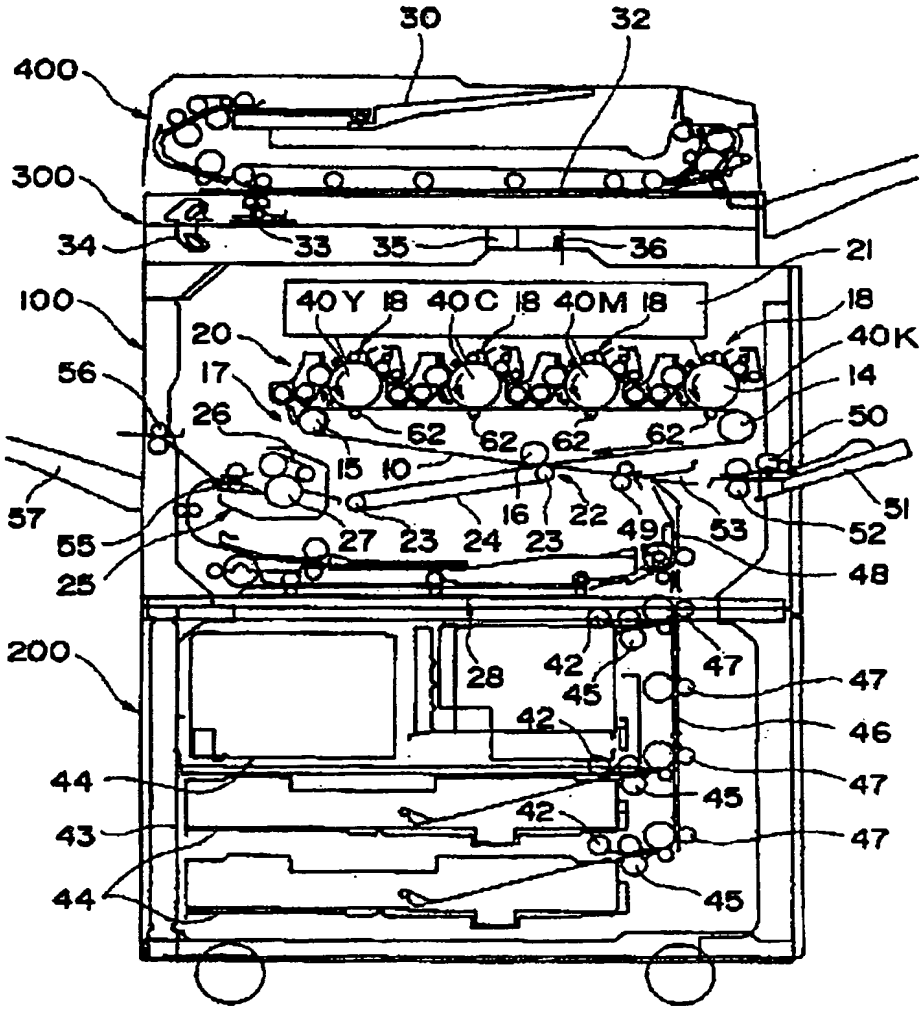
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FIG. 6

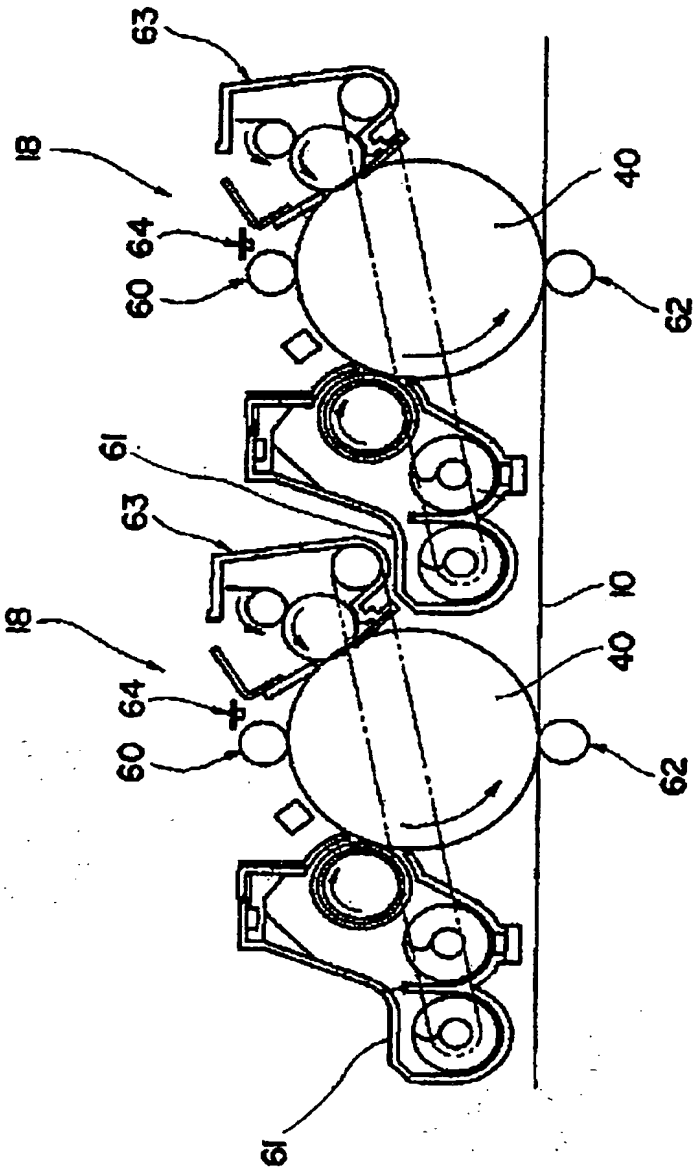


FIG. 7

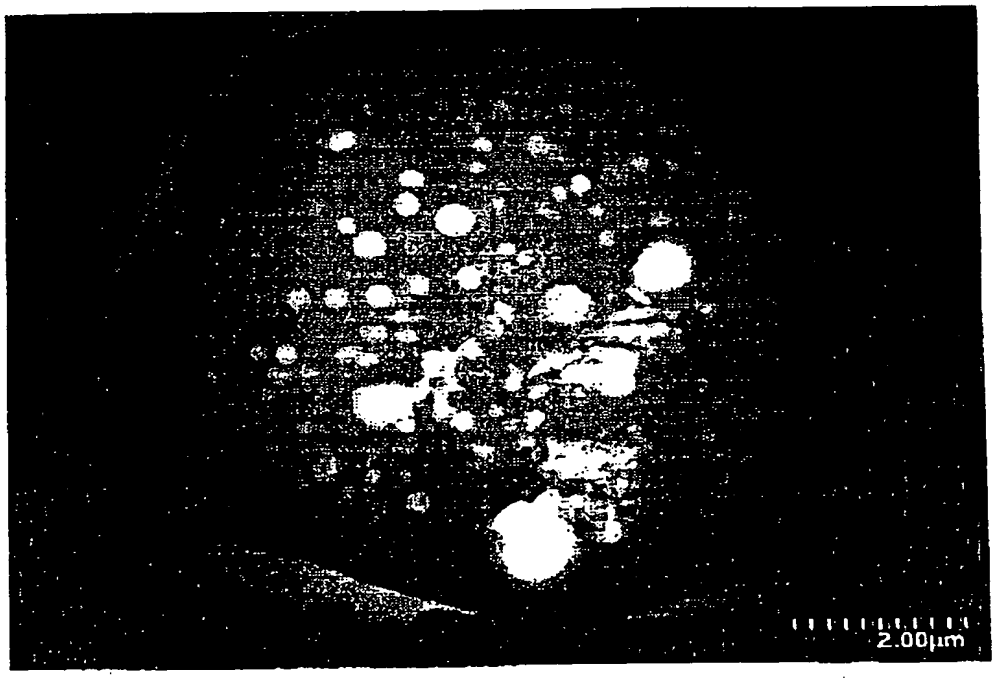


FIG. 8

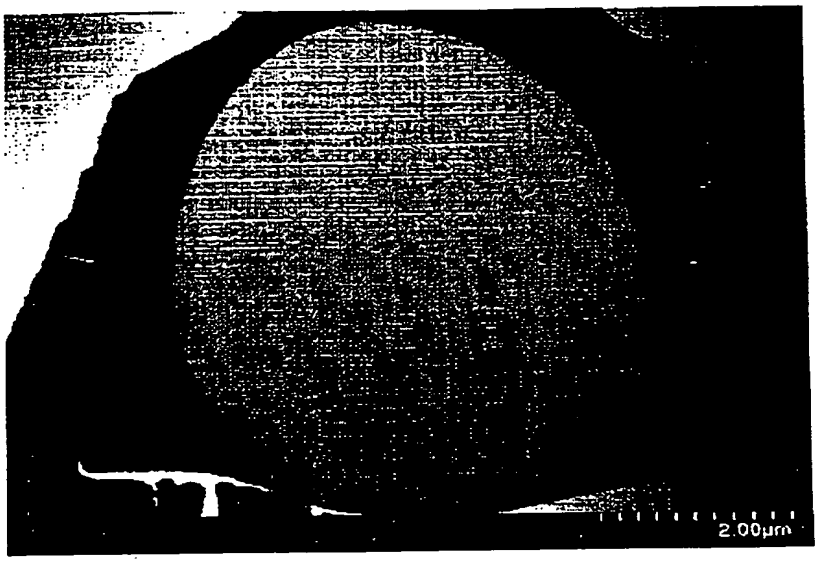
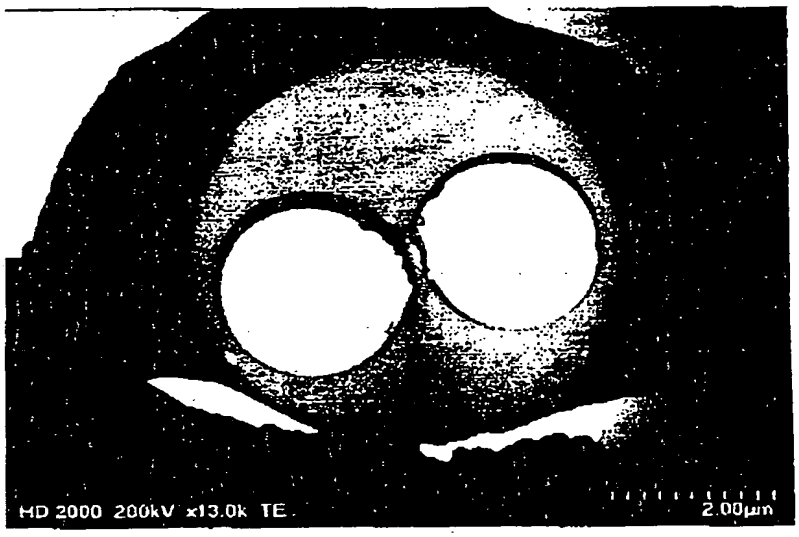


FIG. 9



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WHAT IS CLAIMED IS:

1. An external additives for electrophtographic toner comprising finely divided oxide particulate including a silicon compound and a compound for doping said oxide particulate, wherein particle diameter of the primary particle of said finely divided oxide particulate is in the range of 30 nm to 150 nm, and the primary particle of said finely divided oxide particles is substantially spherical shape having the roundness in the range of 0.95 to 0.996.

2. The additives according to claim 1, wherein elemental ingredients composing the particle of said finely divided oxide particulate are uniformly distributed at surface and inside parts.

3. The additives according to claim 1, wherein said finely divided oxide particulate comprises at least silicon and titanium.

4. The additives according to claim 1, wherein said finely divided oxide particulate is, at surface thereof, being treated by at least silicon-containing organic surface-treating agent.

5. The additives according to claim 1, wherein said finely divided oxide particulate is, at surface thereof, being treated by at least silicon oil, and liberalization ratio of said silicon oil is in the range of 10 % to 60 %..

6. An electrophtographic toner having a volumetric average particle diameter in the range of 2 μ m to 10 μ m, and comprising at least a binder resin and a colorant, and the toner comprises an external additives for electrophtographic toner comprising finely divided oxide particles including a silicon compound and a compound for doping said oxide particles, wherein particle diameter of the primary particle of said finely divided oxide particles is in the range of 30 nm to 150 nm, and the primary particle of said finely divided oxide particles is substantially spherical shape having the roundness in the range of 0.95 to 0.996.

7. An electrophotographic developer of two-component comprising an electrophotographic toner and a carrier of magnetic particles, said electrophtographic toner having a volumetric average particle diameter in the range of 2 μ m to 10 μ m, and comprising at least a binder resin and a colorant, and the toner comprises an external additives for electrophotographic toner comprising finely divided oxide particulate including a silicon compound and a compound for doping said oxide particulate, wherein particle diameter of the primary particle of said finely divided oxide particulate is in the range of 30nm to 150 nm, and the primary particle of said finely divided oxide particulate is substantially spherical shape having the roundness in the range of 0.95 to 0.996.

8. An image forming apparatus loaded by a container filled with an electrophotographic toner, said electrophtographic toner having a volumetric

average particle diameter in the range of 2 μm to 10 μm, and comprising at least a binder resin and a colorant, and the toner comprises an external additives for electrophtographic toner comprising finely divided oxide particulate including a silicon compound and a compound for doping said oxide particulate, wherein particle diameter of the primary particle of said finely divided oxide particulate is in the range of 30nm to 150 nm, and the primary particle of said finely divided oxide particulate is substantially spherical shape having the roundness in the range of 0.95 to 0.996.

Abstract

An external additives for electrophtographic toner comprising finely divided oxide particulate including a silicon compound and a compound for doping said oxide particulate, wherein particle diameter of the primary particle of said finely divided oxide particulate is in the range of 30 nm to 150 nm, and the primary particle of said finely divided oxide particles is substantially spherical shape having the roundness in the range of 0.95 to 0.996, is provided. And this external additives is capable of evading from the embedding of external additives into toner even if after the toner is held in the storage under the condition of high temperature and high humidity, thereby the additives is capable of showing sufficient functions as fluidizing agent and charge supplement agent, and is capable of inhibiting an abnormal charge elevation even after being stored under the low temperature and low humidity.

Fig. 1

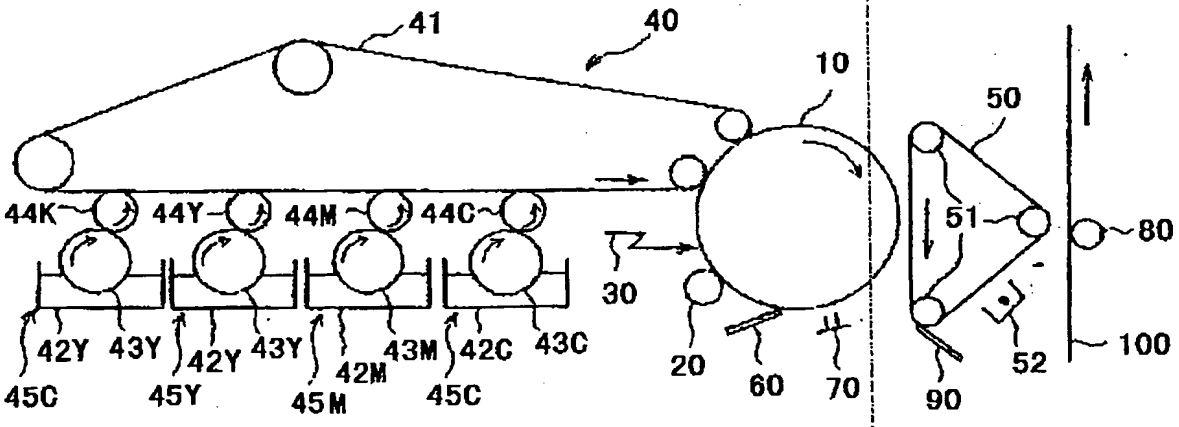

Fig. 2

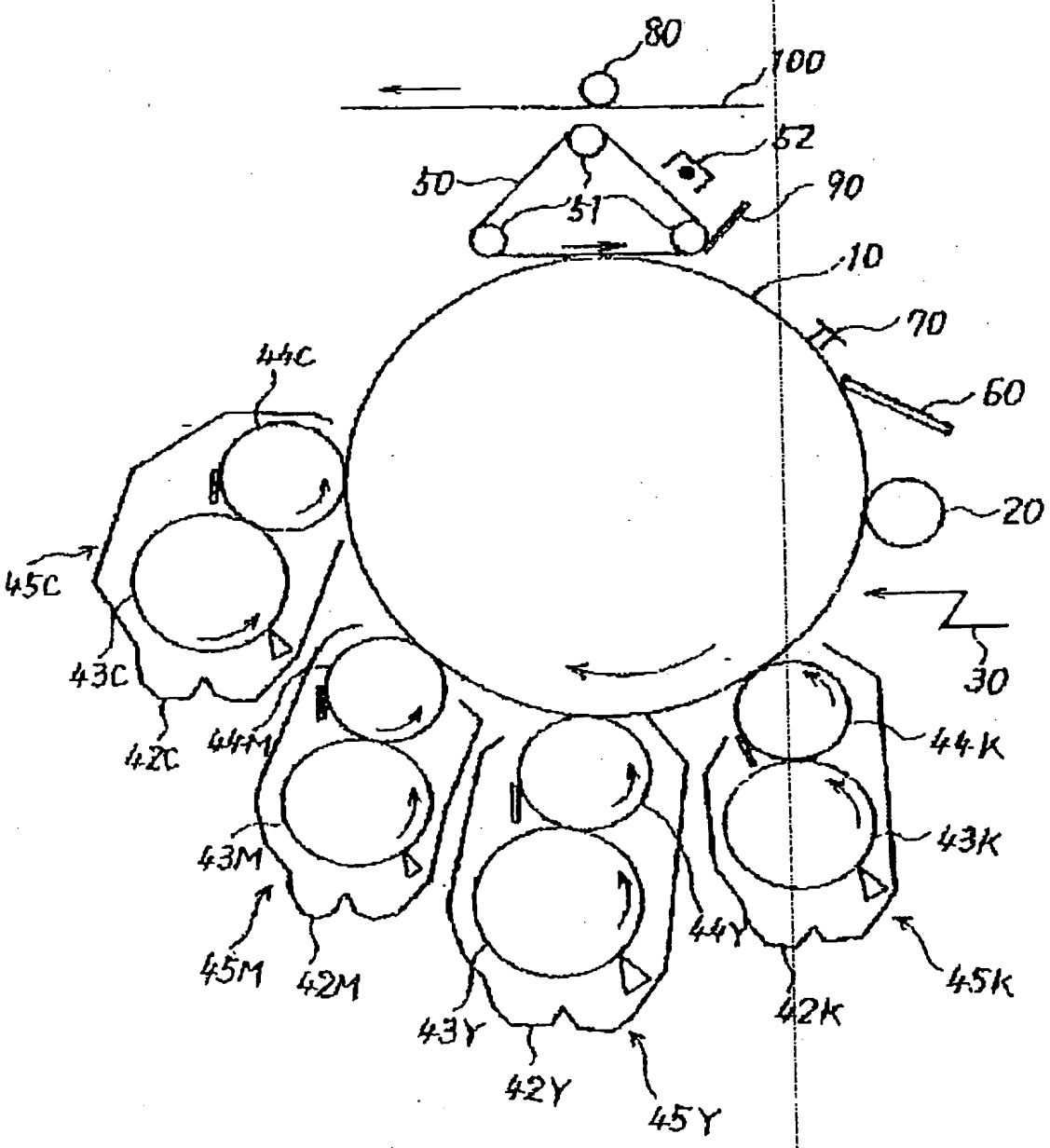

Fig. 3

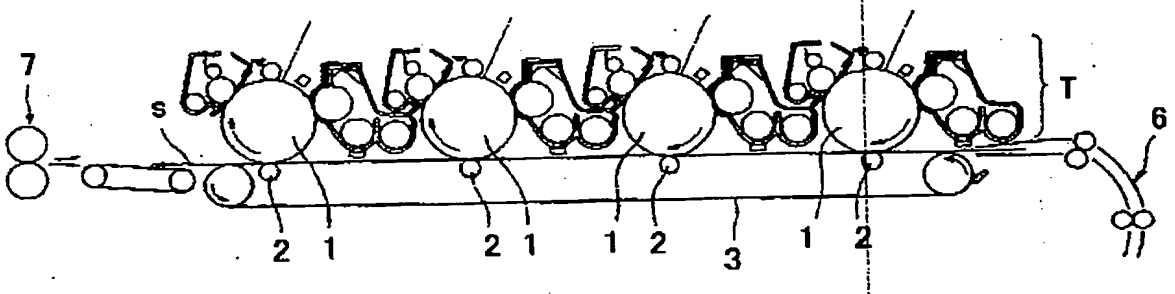

Fig. 4

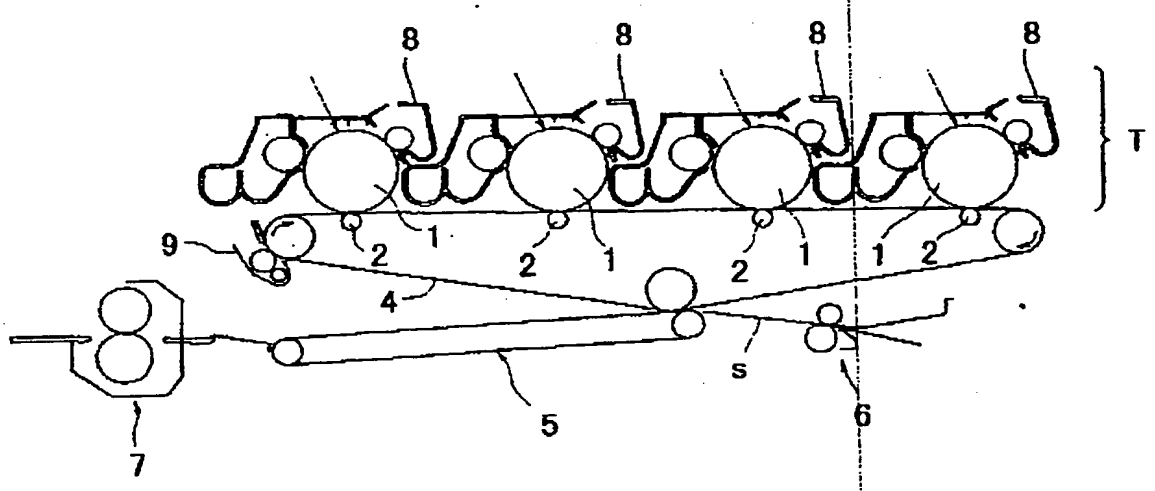

Fig. 5